



## Communicating Uncertainty – An example using the SOCApproach to Reporting IPEDSHR Survey Data

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### ABSTRACT

Beginningin fiscalyear2013,NCE\$mandatedthe useof SOCodesfor submitting IPED\$IRSurveydata. Consequently,institutionsthat previouslysubmittedusing other than SOCodesmight needto apply,retroactively,the mandatedFY2013 SOCApproacht to pre FY2013HRdata in order to generateassociatedhistorical trends. Thispresentationdiscussesomewaysin whichthe uncertainty introducedby this retroactiveapplicationmight bestbe communicatedto the universityofficerswho routinelyutilizethesehistoricaltrends.



## OUTLINE

Motivating example using a specific metric (Ratio of Managers to Faculty)

SOC's at UM

Implications of ignoring uncertainty when reporting this metric

Incorporating uncertainty using a Bayesian approach when reporting this metric

Suggested improvements

Summary

## Motivating Example

\*\*\* Referto SOChandoutNOW!\*\*\*

Fig1. UM IPED\$HRSurveyemployees.

FY	Total	No. Missing SOC	% Missing SOC
2010	28,108	1,126	4.01
2011	28,612	773	2.70
2012	28,852	208	0.72
2013	28,355	0	0.00

Fig2. Jobs(business\_unit+ jobcode)of UM IPED\$HRSurveyemployees.

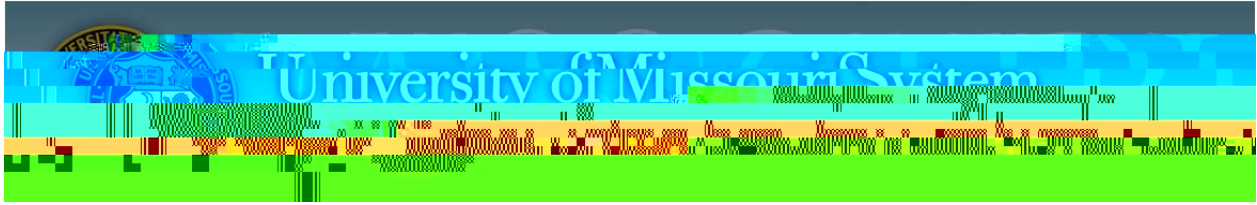
FY	Total	No. Missing SOC	%Missing SOC
2010	3,435	415	12.08
2011	3,440	296	8.60
2012	3,446	159	4.61
2013	3,354		







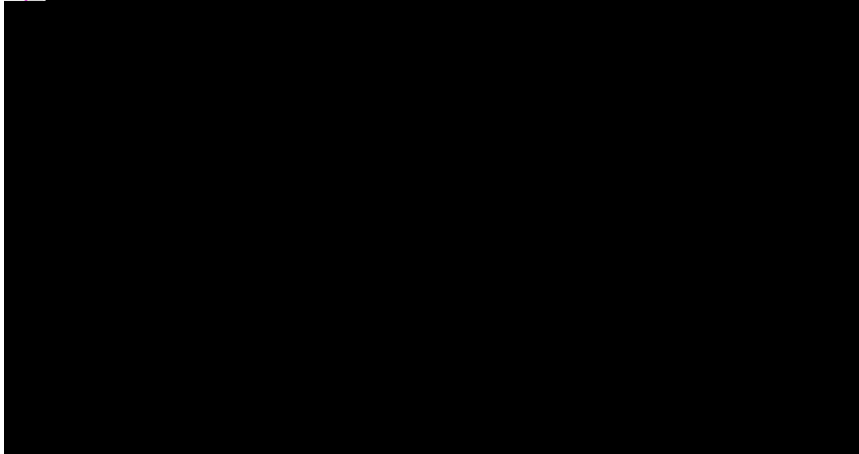




Beta Distribution:

$$f(p) = \frac{1}{B(\alpha, \beta)} p^{\alpha-1} (1-p)^{\beta-1} I_{0,1}(p), \text{ where}$$

$$\alpha > 0, \beta > 0, \text{ and } I_{0,1}(p) = \int_0^p u^{\alpha-1} (1-u)^{\beta-1} du.$$



Wikipedia

$$Exp(p) = \frac{\alpha}{\alpha + \beta}, \text{ and } Mode(p) = \frac{\alpha - 1}{\alpha + \beta - 2}, \text{ and}$$

$$Var(p) = \frac{\alpha\beta}{(\alpha + \beta)^2 + 1}.$$



Example:

Suppose you “believe” (for whatever reason) that, for a given FY:

Each of these employees who have a missing SOC either has a management occupation, or is a postsecondary teacher.

Each is three times more likely to be a teacher than a manager.

Then, for each FY you want parameters  $\alpha$  and  $\beta$  to satisfy:



alpha	beta	Exp(p)	StdDev(p)	Var(p)
0.5	1.5	0.25	0.2500	0.0625
1.0	3.0	0.25	0.1936	0.0375
2.0	6.0	0.25	0.1443	0.0208
4.0	12.0	0.25	0.1050	0.0110
8.0	24.0	0.25	0.0754	0.0057
16.0	48.0	0.25	0.0537	0.0029

**y**

**8**—

**6**—

**4**—

**2**—

**0**—







Remarks:











Bureau of Labor Statistics (<http://www.bls.gov/soc/>)  
On behalf of the Standard Occupational Classification Policy Committee (SOCPC)

Last Modified Date: March 11, 2010

## **2010 Standard Occupational Classification**

Major Minor Broad Group Detailed Occupation



BUSINESS_UNIT	VCVP	VCVP_DESCR	CSD	CSD_DESCR	DEPT	DEPT_DESCR	DEPTID	DEPTID_DESCR	iAcademic_Depts
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KCITY

KACAF Ve Academic Affairs

K&S

College

STLOU	SACAF	VC for Academic Affairs	SA&S	College of Arts & Sciences	SIWGSTU	Institute for Women & Gender S	SIWGSTU	Institute for Women & Gender S	0
STLOU	SACAF	VC for Academic Affairs	SA&S	College of Arts & Sciences	SPSYCTR	Center for Trauma Recovery	SPSYCTR	Center for Trauma Recovery y	0 1
STLOU	SACAF	Ve For Academic Affairs	SA&S	College Of Arts & Sciences	SA&SAGAD				

